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Research Article

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Preliminary Studies on Diversity of Aquatic Insects in Guthia Taal, a Wetland of district Bahraich, U.P.

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Abstract: Aim of the present piece of work was to analyze the diversity of insect fauna of Guthia Taal, a wetland of district Bahraich of Uttar Pradesh (India). During the present study, a total of 32 species of aquatic insects belonging to 5 orders and 24 families were recorded from the three sampling sites from the study area. The study of population of insects in different sites revealed the fact that the population of aquatic insects was governed by both abiotic and biotic factors. The result of the present study reveals a great diversity of aquatic insects in freshwater bodies of Guthia taal and suggests a strong possibility of using insects effectively for biomonitoring programmes.

Keywords: Aquatic insects, Diversity, Guthia Taal, Wetland.

INTRODUCTION

Aquatic insects preferably occur in water. They play an important role in ecosystem functioning by virtue of their abundance, taxonomic diversity and form an important link in many food chains. They consume other invertebrates, small fish, aquatic plants, algae, detritus, and decaying matter and on the other hand, they are also an important primary food sources for fishes, amphibians, reptiles, and birds (Tachet *et al.,* 2003). Aquatic insects are also often used to determine water quality based on type and number of species present.

India is rich in biodiversity and possesses about 1, 08,276 species of insects. Indian subcontinent is one of the mega biodiversity countries of the world occupying ninth position in terms of freshwater mega biodiversity (Mittermeier and Mittermeier, 1997). All over the world about 45,000 species of insects are known to inhabit diverse freshwater ecosystem (Balaram, 2005). Aquatic insects make up 3-5% of all insect species; they are taxonomically diverse and play a crucial role in stability and maintenance of ecosystem, especially in nutrient dynamics. They play important ecological roles in keeping freshwater ecosystems functioning properly (Choudhary and Janakahi, 2015).

Aquatic insects are good indicators of human impact on the freshwater ecosystem (Wetzel, 1983). They are suited for use in environmental impact assessment (EIA) and have a long tradition in water quality monitoring (Bonada *et al*., 2005). The insect order Ephemeroptera, Plecoptera and Trichoptera are the pollution sensitive groups and are used extensively for aquatic insect biomonitoring programmes (Bonada *et al*., 2005). Many species require undisturbed habitats, thus a high number of insect order Ephemeroptera, Plecoptera and Trichoptera taxa indicates high indicators of water quality.

Insects play a significant role in overall biodiversity. The biodiversity is important for an ecosystem by providing many services like nutrients and water cycling, soil formation and retention, resistance against invasive species, pollination of plants, regulation of climate, as well as pest and pollution

(Prakash, 2017). Biodiversity has definite levels and values (Verma, 2016). The genetic diversity acts as buffer in biodiversity (Verma, 2017a). It helps in maintaining the ecological balance which is necessary for widespread biodiversity and human survival (Verma, 2017b, 2018a). Environmental ethics for biodiversity conservation is not sufficient and it needs to be redefining (Verma, 2017c).

Wetlands support vast biodiversity of flora and fauna, provide food and shelter to organisms that thrive in. They occur where the water table is at or near the surface of the land, or where the land is covered by water. Wetlands are among the world's most productive environments (Verma and Prakash, 2018). Wetlands like lake, taal etc. are of utmost importance for several reasons. They represent only a part of our land bases but provide shelter to a great number of plant and animal species including birds, mammals, reptiles, amphibians, fish and invertebrate species. Wetlands are extremely suitable ecosystems to assess the effects of climate change on the density of aquatic insects. Inland wetlands of India serve as the habitat for more than 500 species of aquatic insects which are mainly from Ephemeroptera (mayflies), Odonata (dragonflies) and Trichoptera (caddisflies) (Subramanian and Sivaramakrishnan, 2007).

Several works on aquatic fauna have been published in India of them some works are those by Khan and Ghosh (2001), Subramanian and Sivaramakrishnan (2007), Kumar (2014), Choudhary and Janakahi (2015). But little is known about the aquatic insect diversity of Guthia Taal, a wetland of Bahraich district of Uttar Pradesh. Thus, the present study was aimed to study the faunal diversity of aquatic insects of Guthia Taal.

MATERIALS AND METHODS

Guthia Taal (fig. 1) is a large shallow perennial horse shoe shaped lentic water body. The total catchment area of wetland is about 75.9ha. Out of 75.9ha, 25.3ha is situated in Guthia, 25.3ha in Rucknapur, 22.77ha in Dihawa Sher Bahadur Singh and 2.53ha in Nawgeya villages, of Kaiserganj Tahseel of district Bahraich. But in summer season its water spread area becomes reduced up to 37.95ha. It is situated between the latitude 27.2537^{0}N- 81·54313^{0}E. The Taal is enriched with several type of vegetation such as *Nymphaea, Nelumbo* and Nymphya as well as aquatic birds like Duck, Saras and Bagula. The water of Taal is used for Agriculture and fish culture.

Aquatic insects were collected using dipnet (0.3 x 0.3m) having mesh size 500µ for a period of one year from April 2018 to March 2019. A random sampling of a 50m reach was taken for collecting insect samples. A total of 10 dippings or 10 kicking were carried out along the length of the sampling reach. The collected material was washed by running water through the nets two or three times to detach the insects/larvae adhered in the nets. The samples were then transferred to white trays in small quantities for handpicking aquatic insects using forceps and fine brushes. The handpicked samples were then preserved in 95% ethyl alcohol and brought to the laboratory for further analysis. Before preserving natural colour of insects were noted. The collected samples were examined under a dissecting microscope and identified with the help of literature given by Subramanian and Sivaramakrishnan (2007) and Needham and Needham (1962) and other standard taxonomic keys. The family level identification was done according to proper insect manual.

Fig 1: Satellite image showing 3 sites of Guthia Taal.

RESULTS AND DISCUSSION

The present investigation indicated that wetland, Guthia Taal is rich in aquatic insect fauna. During the present study a total of 32 species of aquatic insects belonging to 5 orders and 24 families have been recorded from the three sampling sites of the study sites (table1). Choudhary and Janakahi (2015) reported 12 species of aquatic insects from Lakhabanjara Lake, Sagar. Sharma *et al*. (2010) reported 12 species of aquatic insects from Kishanpura Lake, Indore. Prakash and Yadav (2016) reported 21 species of aquatic insect from Baghel Taal, a wetland of Bahraich where as Prakash and Verma (2018) reported 20 species of aquatic insect from Semara Taal, a wetland of Siddharthnagar districts of U.P. Among that collected aquatic insects the order Hemiptera was diverse in number of genera. It was represented by 10 families; the order Diptera and Ephemeropteraone were represented by 4 families; the order Coleoptera and Odonta were represented by 3 families. Among the aquatic insects collected from Guthia Taal, the order Hemiptera (14 genera) was dominant and followed by order Odonta (6 genera), Diptera (5 genera), Ephemeroptera (4 genera) and Coleoptera (3 genera). The major aquatic insect taxa Plecoptera and Tricoptera were completely absent in the area studied. In contrast, insect of the order Hemiptera, Diptera, Odonata and Coleoptera showed high species richness and abundance.

Table 1: Distribution and abundance of aquatic insect in three sites of Guthia Taal.

S.N.	Species (Family)	Site-1	Site-2	Site-3
Order: Diptera				
1.	*Brachrdeutera* sp. (Ephdridae)	2	0	0
2.	*Eristalis* sp. (Syrphidae)	8	3	0
3.	*Chironomus* sp. (Chironomidae)	6	4	2
4.	*Diamesinae* sp. (Chironomidae)	2	0	0
5.	*Telmatoscopus* sp. (Psychodidae)	0	0	3
Total No. species (Total No. insects)		**04 (18)**	**02(07)**	**02(05)**
Order: Coleoptera				
6.	*Dineutus* sp. (Gyrinidae)	4	3	0
7.	*Laccophilus* sp. (Dytiscidae)	0	1	0
8.	*Hydrocanthus* sp. (Notoridae)	3	0	2
Total No. species (Total No. insects)		**02 (07)**	**02(04)**	**01(02)**
Order: Hemiptera				
9.	*Notolecta* sp.(Notonectidae)	7	4	0
10.	*Enithares* sp. (Notonectidae)	0	2	2
11.	*Gerris* sp. (Gerridae)	8	0	3
12	*Microvelia* sp. (Vellidae)	6	5	0
13.	*Hebrus* sp.(Hebridae)	0	3	0
14.	*Hydrometra* sp. (Hydrometridae)	6	0	2
15.	*Mesovelia* sp. (Mesoveliidae)	0	4	0
16.	*Micronecta* sp. (Corixidae)	7	5	3
17.	*Neoplea* sp.(Pleidae)	6	0	1
18.	*Nepa* sp. (Nepidae)	0	2	2
19.	*Laccotrephes* sp. (Nepidae)	7	4	0
20.	*Diplonychus* sp. (Belostomidae)	5	0	2
21.	*Belostoma* sp. (Belostomatidae)	3	0	2
22.	*Diplonychus* sp. (Belostomatidae)	4	3	2
Total No. species (Total No. insects)		**10(59)**	**09(32)**	**09(19)**

	Order: Ephemeroptera			
23.	*Baetis* sp. (Baetidae)	11	8	6
24.	*Leptophlebia* sp. (Leptophlebiidae)	9	5	4
25.	*Caenis* sp. (Caenidae)	6	0	0
26.	*Ameletus* sp. (Siphlonuridae)	8	6	0
Total No. species (Total No. insects)		**04 (34)**	**03 (18)**	**02 (10)**
	Order:Odonata			
27.	*Acisoma* sp. (Libellulidae)	9	5	4
28.	*Brachythemis* sp. (Libellulidae)	0	0	2
29.	*Ischnura* sp. (Coenagrionidaes)	9	8	5
30.	*Ceriagrion* sp. (Coenagrionidae)	4	0	0
31	*Enallagma* sp. (Coenagrionidae)	6	3	0
32.	*Tachopteryx* (Petaluridae)	7	0	0
Total No. species (Total No. insects)		**05 (35)**	**03 (16)**	**03 (11)**
Total No. species (Total No. insects)		**25 (153)**	**19 (77)**	**17(47)**

During the study, the maximum number of insects (153) was recorded from site-1 followed by site-2 (77) and site-3 (47). The maximum occurrence of individual and diverse insect species was recorded from site-1 might be due to luxuriant aquatic vegetation which provide food, shelter and breeding sites to aquatic insects. The site-3 was disturbed by anthropogenic activities hence less biodiversity of insect fauna. The structure and composition of biotic community is well reflected with altering water quality and are also shown in their distribution, diversity and abundance pattern of species. Most aquatic habitats with acceptable water quality and substrate conditions support diverse macro invertebrate community. Such community responds to changing habitats and community structure such as invertebrate abundance and composition. Present study reveals greater diversity and abundance of insects at site-1 followed by site-2 and site-3 (Table1 and Fig.1). Hepp *et al*. (2013) reported that destruction of habitat and water chemistry can lead to the reduced diversity of aquatic macro invertebrates.

Aquatic insects are probably best known for their ability to indicate about the water quality in a particular environment. In the process of biological monitoring, healthy aquatic environments have a lot of different sensitive kinds, while the polluted environments have only a few kinds of aquatic insects. Dominance of Hemiptera and Odonata insects suggested that the pond ecosystem of Guthia taal is relatively less polluted. Besides, authors noticed a sufficient number of sarus crane (Verma, 2018b, 2018c).

CONCLUSION

This study documents the composition of aquatic insect communities in different sites of Guthia Taal. It shows the effect of natural and manmade interferences on the diversity of aquatic insects. Aquatic insects are probably best known for their ability to indicate the water quality in a particular environment. If a sample of the aquatic insects in a particular place is analyzed, in terms of sensitive kind versus tolerant kinds one can get a good measure of the environmental health. There is scanty information on the abundance and diversity of aquatic insects in freshwater bodies of eastern Uttar Pradesh. Therefore, it is imperative to make continuous investigation, census and research activities on the taxonomy and diversity of aquatic insects, so that knowledge regarding this important group can be utilized by future researchers as baseline data for further research and conservation planning.

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